

a trunk 12 feet 6 inches in girth and a crown spreading 47 feet 8 inches. The tallest tree measured by Dr. TenBroeck is in Central Park and stands 51 feet 6 inches high with a trunk 14 feet 3 inches at breast height. The Thuja would appear to attain larger dimensions. That illustrated measures 57 feet tall with a girth of 21 feet. It is said to be over 600 years old and is growing in the Chungsan Park, Peking.

Both of these Conifers have long been known to cultivation in western lands, where both have given rise to polymorphous offspring much esteemed in horticulture. *J. chinensis* was known to Kaempfer and was also collected in China by J. Cunningham in 1701 as stated in Plukenet's "Amaltheum Botanicum," page 125 (1705). Linnaeus named it in his "Mantissa," page 127 (1767).

Although the Chinese Juniper is widely cultivated in China, being much planted in temple grounds and about graves, not once in my travels did I note a wild specimen. In many parts of Korea and Japan the dwarf growing *J. chinensis Sargentii* is common but the only place in which I have seen old trees of typical *J. chinensis* was on Dagelet Island in the Japan Sea; growing on the cliffs there and facing the full force of the sea were a number of fine old specimens. They were not tall, ranging from 20 to 35 feet in height with trunks 10 to 15 feet in girth and massive wide-spreading branches. They grow in humus filled cracks on the cliffs and must be of extreme age. The columnar habit of this tree is well known but like the Arborvitae when old age approaches its thinner branches are shed and a few of the thicker ones spread horizontally to form an open, widespreading, more or less rounded or flattened crown. Of course, close inspection of the two trees show wide differences not only in bark but especially in foliage and in fruit, but these are not obvious in a photograph.

THE SPREAD AND THE CONTROL OF PHACIDIUM BLIGHT IN SPRUCE PLANTATIONS

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IN an earlier paper on Phacidium Blight (J. H. FAULL. A Fungus disease of Conifers related to the snow cover. Jour. Arnold Arb. x. 3-8. 1929) I dealt chiefly with its spread and control in the nurseries. Statistical observations and tests recorded therein showed that the spread of Phacidium Blight in the nursery is rapid if no preventive measures are employed, but that it can be fully controlled in seed beds and transplant lines by spraying with lime sulphur in the late fall. Corresponding data, though not as complete with respect to control, are now in hand relative to the blight in plantations.

1. SPREAD OF THE DISEASE

(a) *Spread in an affected plant*

That the blight invades masses of healthy foliage contiguous to those that are already affected can be convincingly inferred from casual inspections. Also it is quite plain from such that the spread is not continuously progressive in point of time, but that it is periodic; or in other words it is manifest that between successive advances there intervenes long intervals of time during which the blight is to all external appearances static. The regions last infected are characterized by a full foliage of unshrunken needles, bright, glaucous, or ashy brown (the shades and tints varying with the host species), with or without a few intermixed green ones. Those of the immediately preceding infection exhibit a greater or less defoliation and the needles that continue to adhere are whitened and shrivelled; while the needles that may still cling to the branches of regions infected at a yet earlier period are much bedraggled and soiled.

But in order to supplement circumstantial inference with direct demonstration, a large number of blighted Spruce trees in plantations were labelled and measured and the extension of the blight in them accurately noted for two successive years. At the same time data were assembled as to the rate and the times of extension of the disease, and for some of them the height-growth of the hosts. The observations made have shown conclusively that (1) the blight spreads to contiguous foliage, and (2) to the latter without regard to its age or location or orientation so long as the temperature of the air in the snow pockets is sufficiently high; that (3) the spread is under the melting snow in the spring only, with the elsewhere green foliage sharply and permanently marked off during the succeeding summer from the adjoining browned masses; and that (4) the spread is to those parts only that are under the snow cover. It is not to be doubted that there could be a spread without the concomitancy of snow, provided that the surrounding atmosphere were maintained at the water-saturation point continuously for a sufficient length of time, that the temperature conditions were favorable to the growth of the fungus, and that the state of the host were such as to permit invasion of its leaves.

Complete data covering observations made in the springs of 1927 and 1928 on one group of twenty-two White Spruce trees are assembled in the subjoined table. These show that there was an average upward spread of the blight of almost four inches as against an average height-growth during the intervening summer of three inches. They also reveal the fact that in fifteen out of the twenty-two trees the blight had extended right to the terminal bud of the leader. These trees are marked by an asterisk (*).

Before leaving the subject of the extension of Phacidium Blight in individual trees it is in place here to state that attempts have been made to find out whether or not there may be some spread through the stem, that is, whether or not the fungus causing the blight ever grows downward

Vertical upward spread of Phacidium Blight, and height growth in 22 White Spruce trees, planted Fall of 1924.

No.	Height; Spring, 1927	Height; Spring, 1928	Increase in Height	Upper Limit of Blight; Spring, 1927	Upper Limit of Blight; Spring, 1928	Increase of Blight
1	16 in.	21 in.	5 in.	9 in.	15 in.	6 in.
2	13	18	5	10	13	3
3	11	15	4	9	*15	6
4	17	19	2	14	*19	5
5	17	22	5	11	13	2
6	14	14	0	9	*14	5
7	10	12	2	10	11	1
8	15	17	2	13	13	0
9	10	13	3	8	*13	5
10	14	19	5	12	*19	7
11	12	15	3	12	*15	3
12	10	13	3	9	*13	4
13	11	13	2	11	*13	2
14	10	12	2	10	*12	2
15	13	15	2	11	*15	4
16	18	22	4	15	19	4
17	8	8	0	7	* 8	1
18	11	14	3	11	*14	3
19	10	14	4	9	*14	5
20	8	10	2	7	*10	3
21	14	19	5	10	18	8
22	12	15	3	9	*15	6

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Average 3.0 inches

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Average 3.9 in.

through the bases of infected needles into the tissues of the stem, and thence upward into healthy needles by way of their bases. From what could be determined it would seem that the basal layers of cork prevent invasion by the hyphae through such routes. It is possible that there may be exceptions to this rule to be revealed by more persistent search, but so far none have been found. It is patent to anyone who has the slightest acquaintance with the disease that in general its spread is not by way of the stem; on the contrary it is everywhere apparent that it passes over directly to the green foliage of branches which happen to be pressed into contact with blighted ones by the weight of overlying snow or other means, or that have been inoculated with the reproductive elements of the blight-causing fungus. Moreover, the non-aggressiveness of the causal organism after the spring thaws are past, up until the period of sporulation in the fall, affords indirect evidence that it does not invade healthy needles adjacent to diseased ones through the intervening stem.

(b) *Spread from affected plants*

Obviously it is important from the standpoint of control to become acquainted with the phenomena that characterize the dissemination of Phacidium Blight from plant to plant. In the earlier paper referred to